



LHC4913 SERIES

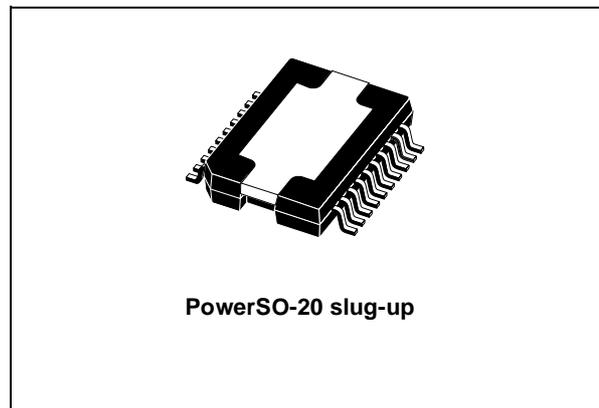
3A POSITIVE LOW DROP VOLTAGE REGULATOR WITH INHIBIT FUNCTION

ADVANCE DATA

- LOW OUTPUT CAPACITANCE: 1 μ F
- LOW DROP VOLTAGE:
0.5V @ I_O=1A
1.5V @ I_O=3A
- OVERTEMPERATURE PROTECTION
- OVERCURRENT PROTECTION
- OUTPUT SHORT CIRCUIT MONITORING,
SIGNALLED BY TTL OUTPUT
- ON/OFF EXTERNAL CONTROL BY MEANS
OF TTL COMPATIBLE INPUT
- ADJUSTABLE CURRENT LIMITATION
PROTECTS OUTPUTS FROM DAMAGING
SHORTCIRCUITS
- REMOTE SENSING OPERATION

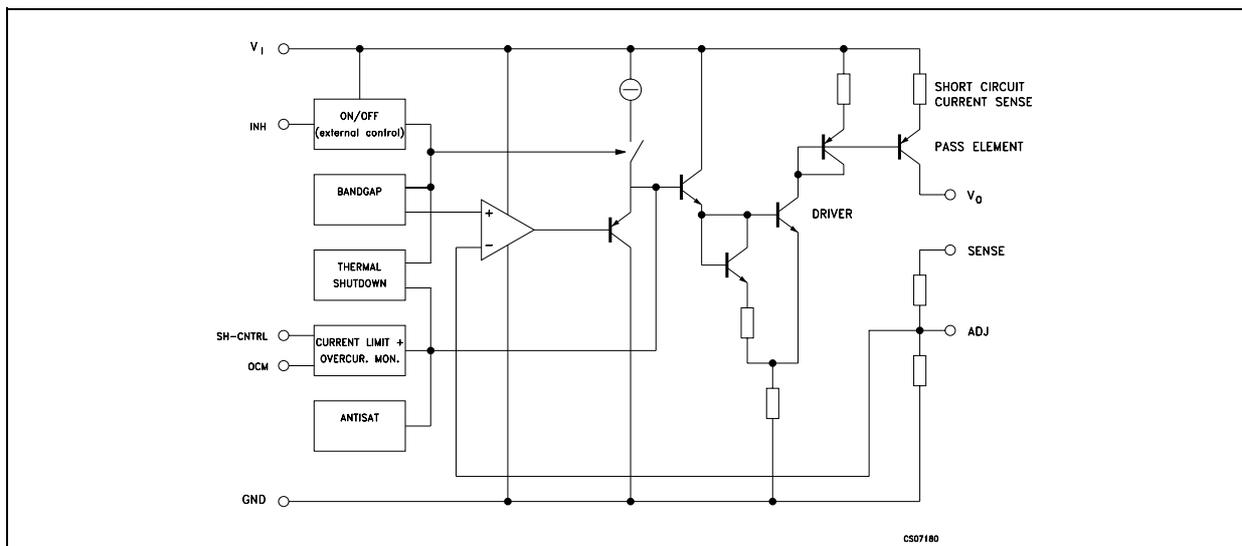
DESCRIPTION

The LHC4913 is a positive Voltage Regulator family including both fixed and adjustable versions. Housed into SO-20 slug-up package with stand off zero, it is specifically intended for



applications in rugged environments, such as Nuclear Physics, in which it has to withstand large amounts of radiation doses during operating life. The fixed output voltages available are 2.5, 3.0, 3.3, 5.0 and 8.0V. Input voltage ranges from 3 to 12V.

SCHEMATIC DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

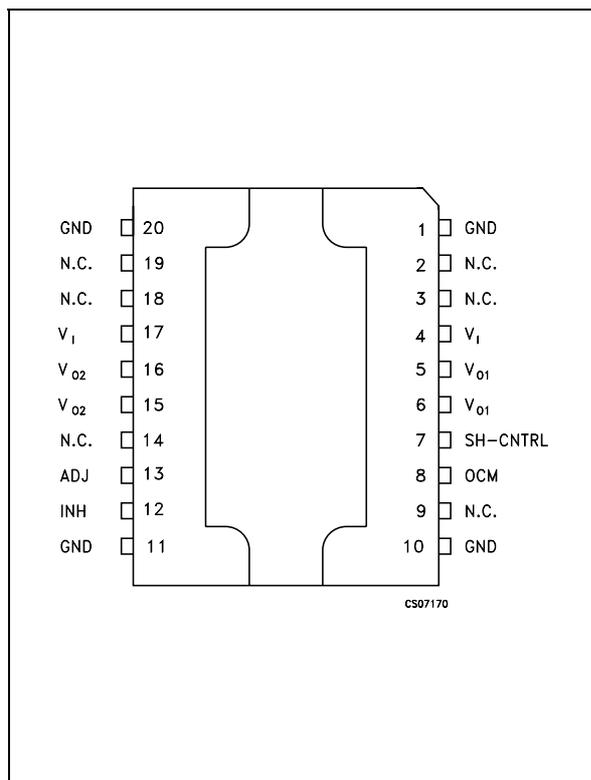
| Symbol | Parameter | Value | Unit |
|-----------|--------------------------------------|--------------------|------|
| V_I | DC Input Voltage | 14 | V |
| V_{INH} | INHIBIT Input Voltage | $V_I + 0.5$ | V |
| I_O | Output Current | Internally limited | |
| P_{tot} | Power Dissipation | Internally limited | |
| T_{stg} | Storage Temperature Range | -40 to +150 | °C |
| T_{op} | Operating Junction Temperature Range | -40 to +125 | °C |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

THERMAL DATA

| Symbol | Parameter | PowerSO-20 slug-up | Unit |
|----------------|----------------------------------|--------------------|------|
| $R_{thj-case}$ | Thermal Resistance Junction-case | 2 | °C/W |

CONNECTION DIAGRAM (top view)



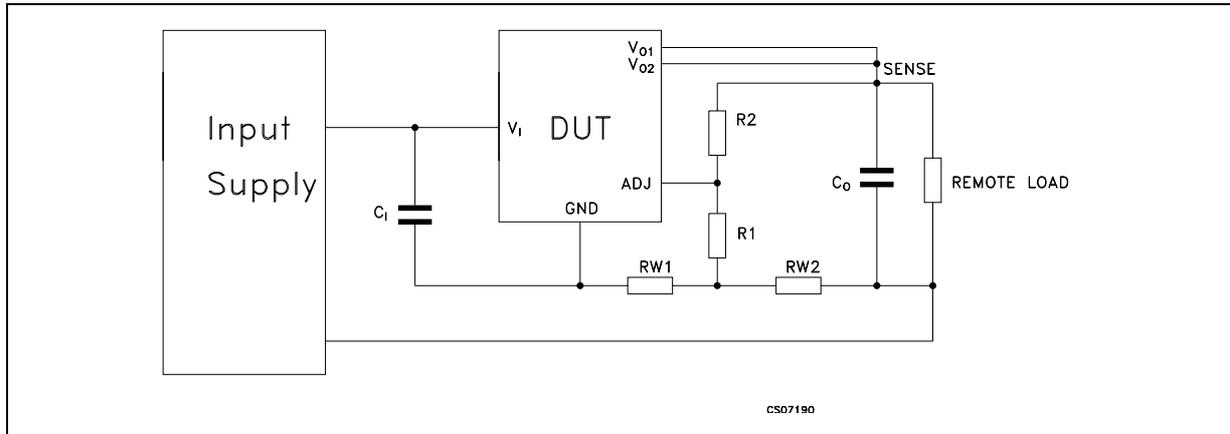
PIN DESCRIPTION FOR ADJUSTABLE VERSION

| Pin N° | Symbol | Name and Function |
|--------|----------|---------------------------------|
| 1 | GND | Ground Pin |
| 2 | NC | Not Connected |
| 3 | NC | Not Connected |
| 4 | V_I | Positive Supply Voltage |
| 5 | V_{O1} | Output Pin |
| 6 | V_{O1} | Output Pin |
| 7 | SH-CNTRL | Short Circuit Valve Controlling |
| 8 | OCM | Over Current Monitoring |
| 9 | NC | Not Connected |
| 10 | GND | Ground Pin |
| 11 | GND | Ground Pin |
| 12 | INH | Inhibit |
| 13 | ADJ | Adjustable pin |
| 14 | NC | Not Connected |
| 15 | V_{O2} | Output Pin |
| 16 | V_{O2} | Output Pin |
| 17 | V_I | Positive Supply Voltage |
| 18 | NC | Not Connected |
| 19 | NC | Not Connected |
| 20 | GND | Ground Pin |

ORDERING CODES

| TYPE | Power-SO20 slug-up | OUTPUT VOLTAGES |
|---------|--------------------|-----------------|
| LHC4913 | LHC4913PDU | Adjustable |

APPLICATION DIAGRAM FOR REMOTE SENSING OPERATION FOR ADJUSTABLE VERSION



FUNCTIONAL DESCRIPTION

ADJUSTABLE VERSION

The ADJUST pin shall be set at 1.225V with the adequate fraction of V_O generated by a resistive divider inserted between V_O and GND. The ADJ-GROUND resistor value must not be greater than 2.5 K Ω . For a given V_O the following holds:
 $V_O = V_{ADJ}(1 + R_2/R_1)$.

OVERTEMPERATURE PROTECTION OPTION

The LHC4913 is protected by a junction-temperature detection circuit, turning the device "OFF" when the temperature attains 175°C. The recovery of the ON mode occurs with a hysteresis of 40 °C.

OVERCURRENT PROTECTION

The device is equipped with a circuit having the purpose of limiting the maximum load current, in order to protect the output stage against possible overcurrent-related damages. Its threshold can be modified externally by means of a resistor put between the pins SH-CNTRL and V_I . For this characteristic, when the load current gets close to the above threshold, the regulation is inhibited. Thus, an excellent operation is granted only up to 66% of preset maximum current.

SHORT CIRCUIT MONITORING / SIGNALLING

In the event of an overcurrent at the output, a voltage level of 0.4V is present at the OCM pin. In others conditions, this voltage equals V_I .

REMOTE SENSING FOR ADJ VERSION

As pointed out in the pin configuration plot, V_O and SENSE are not linked to each other in order to get a regulation with a load located far away from the

chip. Under ordinary applications, the SENSE shall be connected to both V_{O1} & V_{O2} . To obtain the best performances it is recommended to be compliant with the configuration shown in the figure at top page.

What can degrade the regulation performances of this configuration is the variable voltage drop between the chip ground and the load termination V_L .

This is brought mostly by the current I_b coming from the output power base and going to ground through the driver stage. The degradation amount to $(1 + R_2/R_1) \times R_{W1} \times I_{Bmax} + R_{W2} \times I_{Bmax}$

APPLICATION INFORMATION

Recommended $V_I = 12V$ Max, $V_O = 1.225V$ Min.

The device is designed to operate with any $V_I - V_O$ value according to above mentioned and thermal dissipation limits.

An input filtering capacitor of 100nF is always mandatory.

The two V_I pins shall always be connected in parallel, this applies also for the four V_O pins.

Device stability is granted in any circumstance with a 1 μ F output capacitor.

The device operation is guaranteed with any $V_{in} - V_{out}$ dropout under the above thermal constraints.

Although two embedded protections first mentioned (the overtemperature and the overcurrent) ensure the L4913 integrity against any fault load condition, it is recommended to comply with the specified absolute maximum ratings also in applications involving fast switching of output currents.

To achieve this, a polyester capacitor of at least 470nF, put close to the regulator between input and ground, improves the L4913 reliability by

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filtering the overvoltages spikes coming out during this particular operation.

To avoid undervoltages spikes leading both input and output well below ground, it is in addition

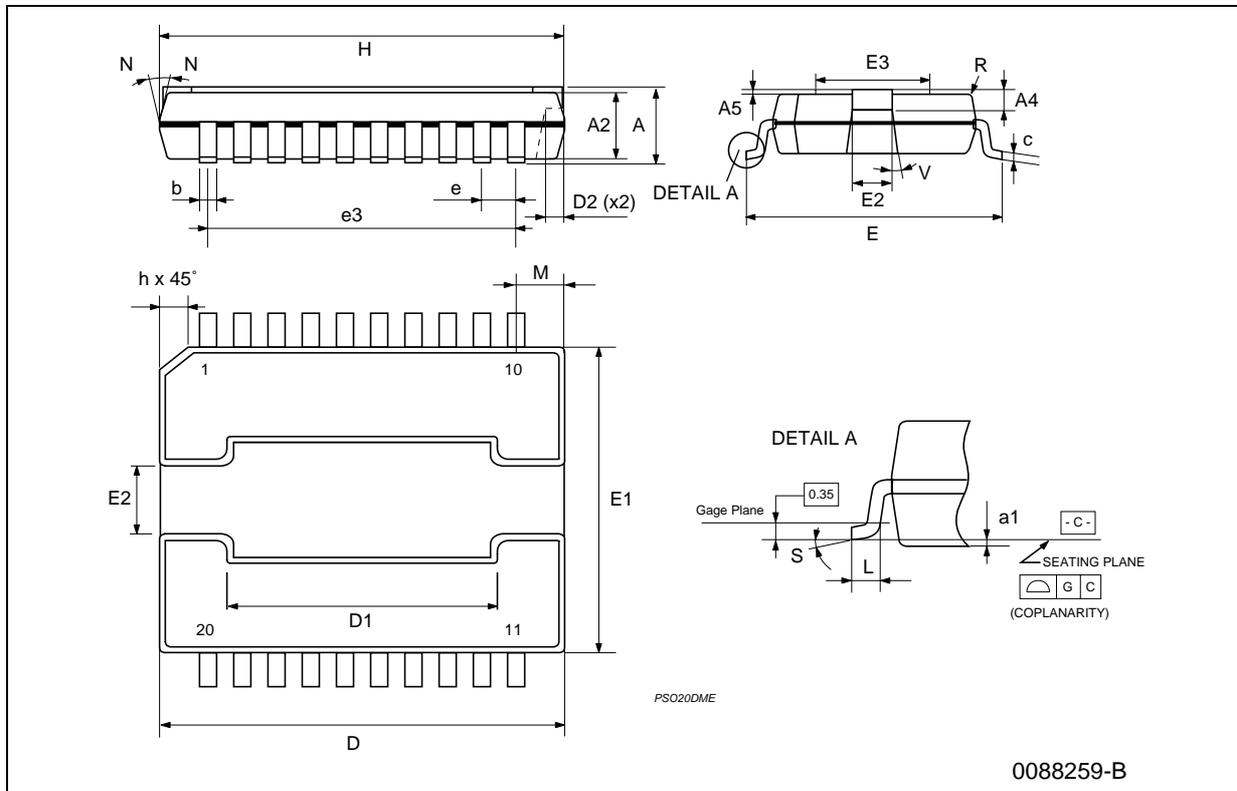
recommended to put one reverse-biased Schottky diodes between output and ground.

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$, $V_I = V_O + 2.5\text{V}$, $V_O = 3\text{V}$, $C_I = 0.1\mu\text{F}$, $C_O = 1\mu\text{F}$ (tantalium), unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------------|----------------------------------|---|---------------------------|-------------|------|--------------------|
| V_I | Input Voltage | $I_O = 3\text{A}$ $T_J = -55$ to 125°C | 3 | | 12 | V |
| V_O | Output Voltage | $I_O = 5\text{mA}$ $T_J = -55$ to 125°C | 2 | | 2 | % |
| | | $I_O = 3\text{A}$ $T_J = -55$ to 125°C | 1.23 | | 9 | V |
| I_{SHORT} | Output Current Limit | Adjustable | | 3.8 | | A |
| $\Delta V_O / \Delta V_I$ | Line Regulation | $V_I = V_O + 2.5\text{V}$ to 12V , $I_O = 5\text{mA}$ | | 0.1 | | % |
| $\Delta V_O / \Delta V_I$ | Load Regulation | $I_O = 5\text{mA}$ to 3A | | 0.4 | | % |
| V_d | Dropout Voltage | $I_O = 400\text{mA}$ $T_J = -55$ to 125°C | | 0.35 | 0.7 | V |
| | | $I_O = 1\text{A}$ $T_J = -55$ to 125°C | | 0.5 | 1 | V |
| | | $I_O = 2\text{A}$ $T_J = -55$ to 125°C | | 0.75 | 1.5 | V |
| | | $I_O = 3\text{A}$ $T_J = -55$ to 125°C | | 1 | 2 | V |
| I_d | Quiescent Current | $V_I = V_O + 2.5\text{V}$ to 12V , $V_O = 1.23\text{V}$ $I_O = 5\text{mA}$ On Mode | | 1.6 | 4 | mA |
| | | $V_I = V_O + 2.5\text{V}$ to 12V , $V_O = 1.23\text{V}$ $I_O = 30\text{mA}$ On Mode | | 2.7 | 8 | mA |
| | | $V_I = V_O + 2.5\text{V}$ to 12V , $V_O = 1.23\text{V}$ $I_O = 300\text{mA}$ On Mode | | 11 | 24 | mA |
| | | $V_I = V_O + 2.5\text{V}$ to 12V , $V_O = 1.23\text{V}$ $I_O = 1\text{A}$ On Mode | | 32 | 64 | mA |
| | | $V_I = V_O + 2.5\text{V}$ to 12V , $V_O = 1.23\text{V}$ $I_O = 2\text{A}$ On Mode | | 64 | 130 | mA |
| | | $V_I = V_O + 2.5\text{V}$ to 12V , $V_O = 1.23\text{V}$ $I_O = 3\text{A}$ On Mode | | 94 | 200 | mA |
| | | $V_I = 12\text{V}$ $V_{\text{INH}} = 3\text{V}$ Off Mode | | 0.3 | | mA |
| SVR | Supply Voltage Rejection | $V_I = V_O + 2.5\text{V} \pm 0.5\text{V}$, $I_O = 5\text{mA}$ | $f = 120\text{Hz}$ | 70 | | dB |
| | | | $f = 33\text{KHz}$ | 50 | | |
| $V_{\text{INH(OFF)}}$ | Turn Off Voltage | $T_J = 0$ to 125°C | 2 | | | V |
| | | $T_J = -55$ to 0°C | 2.4 | | | V |
| $V_{\text{INH(ON)}}$ | Turn On Voltage | $T_J = -55$ to 125°C | | | 0.8 | V |
| I_{INH} | Shutdown Input Current | $V_I = 12\text{V}$ $V_{\text{INH}} = 5\text{V}$ | | 120 | | μA |
| C_O | Output Capacitance | $I_O = 5\text{mA}$ to 3A | | 1 | | μF |
| ESR | Electrical Series Resistance | $I_O = 5\text{mA}$ to 3A | 2 | | 6 | Ω |
| V_{OCML} | Overcurrent Monitor Voltage Low | $I_{\text{OCM}} = 10\text{mA}$ (sunked current) $V_I = 12\text{V}$ | | 0.4 | | V |
| V_{OCMH} | Overcurrent Monitor Voltage High | $I_{\text{OCM}} = -10\mu\text{A}$ (sourced current) | $V_I = V_O + 2.5\text{V}$ | $V_O + 2.5$ | | V |
| | | | $V_I = 12\text{V}$ | 12 | | |
| eN | Output Noise Voltage | $B = 10\text{Hz}$ to 100KHz $I_O = 1\text{A}$ | | 66 | | $\mu\text{Vrms/V}$ |

PowerSO-20 Slug-up MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 3.25 | | 3.5 | 0.128 | | 0.138 |
| a1 | 3 | 3.15 | 3.3 | 0.118 | 0.124 | 0.130 |
| A2 | | | 0.1 | | | 0.039 |
| A4 | 0.8 | | 1 | 0.031 | | 0.039 |
| A5 | 0.15 | 0.2 | 0.25 | 0.006 | 0.008 | 0.010 |
| b | 0.4 | | 0.53 | 0.016 | | 0.021 |
| c | 0.23 | | 0.32 | 0.09 | | 0.013 |
| D | 15.8 | | 16 | 0.622 | | 0.630 |
| D1 | 9.4 | | 9.8 | 0.370 | | 0.386 |
| D2 | | 1 | | | 0.039 | |
| E | 13.9 | | 14.5 | 0.547 | | 0.571 |
| e | 1.12 | 1.27 | 1.42 | 0.044 | 0.050 | 0.056 |
| e3 | | 11.43 | | | 0.450 | |
| E1 | 10.9 | | 11.1 | 0.429 | | 0.437 |
| E2 | | | 2.9 | | | 0.114 |
| E3 | 5.8 | | 6.2 | 0.228 | | .0244 |
| G | 0 | | 0.1 | 0.000 | | 0.004 |
| h | | | 1.1 | | | 0.043 |
| H | 15.5 | | 15.9 | 0.610 | | 0.626 |
| L | 0.8 | | 1.1 | 0.031 | | 0.043 |
| N | | | 10° | | | 10° |
| R | | 0.6 | | | 0.024 | |
| S | 0° | | 8° | 0° | | 8° |
| V | 5° | | 7° | 5° | | 7° |



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